SECTION 13341

GLAZED CANOPY STRUCTURE

PART 1 GENERAL

1.01 SCOPE

A. Comply with all requirements of Division 1.

B. Work under this section is the responsibility of the Specialty Structural Glass Contractor and consists of furnishing everything necessary for and incidental to the execution and completion of the point supported structural glass system, spaceframe roof structure and accessory work. The complete System shall be purchased from the Structural Glass Contractor as a single source.

C. The General Contractor as used herein refers to the entity contracting for the structural glazing.

D. Related Sections:

1. Section 07900 - Joint Sealers
2. Section 08800 - Glazing

1.02 DESCRIPTION OF WORK

A. The extent of the point supported structural glazing, spaceframe roof structure and associated work as defined above is shown on the architectural and structural drawings.

B. The work includes the following:

1. Engineering design of the structural glazing, spaceframe roof structure and accessory parts by the Structural Glass Contractor, including structural calculation submittals.
2. Fabrication, packaging and delivery to job site.
3. Installation by an installer approved by the Structural Glass Contractor or under the direction of a technical advisor of that Contractor.

1.03 QUALITY ASSURANCE

A. Structural Glass Contractor's Qualifications:

1. The Structural Glass Contractor shall provide in-house services which include full design, engineering and installation service for the structural glazing as a single entity. Subcontracting with outside sources for any of these services is not acceptable. The assembly of joint ventures to provide these services is also not acceptable.
2. Project shall be tendered by, contracted for and managed directly by the Structural Glass Contractor. Tenders or project management by a sales agent, intermediary, glazing contractor, agent or distributor of the listed Structural Glass Contractor will not be acceptable. <u>The General Contractor must contract this work from the preapproved Structural Glass Contractors as listed under this section directly and not through an intermediary.</u> No exceptions.
3. All bidding Structural Glass Contractors must submit a current IAS certification for the spaceframe system that they intend to utilize PRIOR to bid.

B. Safety Glass: Where safety glass is indicated or required by authorities having jurisdiction, provide the types of products that comply with ANSI Z97.1 and CPSC 16 CFR 1201 Category II.

1.04 SUBMITTALS

A. Structural Calculations: Prior to fabrication of the structural glazing, submit design calculations prepared in accordance with current design rules for structural glazing and applicable codes as called for by the Project Engineer. **The calculations shall be prepared, signed, and sealed by an engineer licensed in the state of Virginia.** Include analysis and design for all combinations of load cases such as live, dead, wind, thermal, snow, seismic, etc…

1. Supply structural reactions in each axis, at each typical support, for review and acceptance by the Project Engineer, and the maximum glass deflections in all axis.
2. Supply calculations for support and other details as necessary.
3. Panel thickness shall be sized by the Structural Glass Contractor.
4. Existing text reports are only acceptable as proof of capacity calculations, but will not be acceptable in lieu of calculations.

B. Shop Drawings: Submit complete shop drawings including glass panel layouts and details. **The shop drawings shall be prepared, signed, and sealed by an engineer licensed in the state of Virginia.** Show dimensioned layout of structural glazing in relation to adjacent work such as walls, columns, beams, slabs, etc…

1. Include details of all supports and data to show provisions for vertical and horizontal expansion/contraction and building movements as necessary.
2. Identify all materials, attachments devices and accessories including necessary tolerances.

C. Installation Drawings: After approval of shop drawings, provide a detailed set of field installation drawings and a written installation procedure. Identify each part by size and number.

D. Product Data: Material description for tapes, compounds, gaskets and other material.

E. Samples: Submit samples of glass and glazing materials required for the project. Samples of glass shall be 12" x 12". Samples of sealants or gaskets shall be 12" long. Submit samples of fixing hardware assemblies, bolts and accessories.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All glass shall be manufactured, crated, stored, handled and shipped in a manner that will provide unscratched and undamaged units delivered to the site. Fittings which engage with the glass shall be individually boxed in a way to protect edges from damage and/or scratching.

B. Time the delivery of materials to the site to ensure uninterrupted progress of the installation work.

1.06 PROJECT CONDITONS

A. Field Measurements: Where the system is indicated to fit against walls and other construction, the Structural Glass Contractor shall verify dimensions by field measurements before installation and notify General Contractor of any deviations from approved shop drawings. General Contractor shall correct conditions to comply with the

system tolerances specified for the project and as indicated in the approval drawings, which may be tighter than industry standard.

B. Structural glass shall be fabricated in accordance with approved shop drawings which shall include dimensional approval from the Architect and General Contractor.

C. Coordinate fabrication schedule with construction progress to avoid delaying the work.

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

A. Design the structural glazing system and applicable other components for the locations and conditions shown in the architectural and structural drawings and to the loading requirements and codes specified in the bid documents. In addition, if not specifically called for in the documents, consider the following:

1. Temperature variation: 5 to 100 degrees (i.e., +/-5 degrees from a medium temperature of 53 degrees Fahrenheit).
2. Loads created by installation techniques and lifting devices.

B. The Project Engineer shall provide in the bid documents the following criteria that shall be accommodated in the system's design:

1. Deflections of edge beams due to loading applied after the installation of the cladding.
2. Side sway movements of the adjacent structure due to wind and seismic load.
3. Anticipated deflections due to self-weight of the structural glass system.

2.2 FABRICATION

A. Provide all glass and structural hardware, connectors, fasteners and accessories required for a complete installation of the structural glazing as indicated in approved shop drawings.

B. Code each part for easy identification. Cross reference this coding to shop/installation drawings and to shipping lists.

2.3 STRUCTURAL GLASS CONTRACTOR

A. Contractor/Manufacturer: The construction documents are based on the PSG-System, and KK-System as manufactured and engineered by Novum Structures of Menomonee Falls, WI (Phone: 262-255-5561). As such, Novum Structures is a pre-approved Structural Glass Contractor for the scope described under this section.

1. Others acceptable as long as in strict conformance with the complete set of construction documents include:
    a. Unisky Corporation
    b. Binzwanger Glass

B. System Description: The system is comprised of structural glass panels held by rotules through factory drilled holes such that the glass can be mechanically fastened to the support structure. Joints are comprised of uninterrupted wet silicone with an extruded silicone profile inner compression seal. Glass shall be supported utilizing a spherical node and cylindrical tube, mechanical assembled spaceframe system.

1. Glass and Glazing System
    a. All glass must be fully tempered, clear, laminated glass. Overall thickness of the glass is to be determined by the Structural Glass Contractor in accordance with specifications and drawings. Laminated glass is to be produced using a PVB interlayer bonded via an autoclave heat and pressure process. Minimum interlayer thickness is to be 0.060". (Poured or cast resin laminates will not be permitted.)
    b. All glass must be horizontally tempered, eliminating tong marks. All edges will be ground flat with a frosted appearance unless otherwise noted. All edgework, holes and notches in the tempered glass panels will be completed before tempering and will comply with the requirements stated below:
        i. ASTM C1036 Standard Specification for Flat Glass.
        ii. ASTM C1048 Standard Specification for Heat-Treated Flat Glass.
        iii. ASTM C1172 Standard Specification for Laminated Architectural Flat Glass.
        iv. Safety glazing requirements as defined in ANSI Z97.1 and CPSC 16 CFR 1201.
    c. The Subcontractor shall demonstrate that the stresses induced in the glass by the fittings are compatible with the strength of the glass and the needs of the performance section of this specification, especially at the holes. Provide finite element calculations to show compliance. Pre-stressing of the glass around holes, to a level which is compatible with the design and use of the fittings, is not permissible.
    d. Glass Tolerances: Squareness of panels governs other tolerances and shall be within 3.0 mm of specified dimensions. Edge lengths shall be within 1.5 mm of specified dimensions. Holes shall be within 1.0 mm of specified locations. Bow shall be better than 0.1%.
    e. Glass Holes: All drilled holes shall be countersunk or straight through. Fitting type shall be as shown in the architectural drawings. If glass is suspended, fitting shall not be countersunk. All edges of holes shall be cleaned and free of loose or ground materials. In insulated glass units, the holes shall be fully sealed and warranted to perform under applied loads and conditions by the glass manufacturer.
2. Roof Steel: Structural Steel Spaceframe System
    a. System Description: The system shall be fabricated from steel and consists of cylindrical tubular members with conical ends connected to solid forged spherical nodes with special steel sleeves and steel bolts, without exception. Bottom chord shall consist of a W-section with flange in a horizontal orientation to facilitate window washing equipment.
        1. Steel Tubes:
            a. Tube material shall conform to ASTM A500 Gr. B or equivalent minimum.
            b. Assembly to consist of a hollow tube with a forged cone welded on each end. Cone materials shall be Grade 1018 to ASTM A576 or equivalent. Substitution of sealed tubes is not acceptable.
        2. Steel Nodes:
            a. Nodes to consist of hot forged solid steel spheres conforming to AISI C 1045 material, normalized or equivalent. They shall be drilled and tapped as necessary. Extra holes other than those specifically shown in approved drawings are not permitted.
            b. Joints using gusset plates, two piece assemblies, friction fit or castings shall not be used.
        3. Bolt Mechanism:
            a. Bolts shall conform to DIN 267 Grades 5.6, 8.8, 10.9 or proven equivalent.
            b. Pins shall be stainless steel.

c. Tightening sleeves shall be galvanized mild steel of Grade 1018 to ASTM A576 or equivalent, or as required for ductility and strength.

4. Finishes:
   a. Galvanizing: All spaceframe tubes shall be hot-dip galvanized on both exterior and interior surfaces to a minimum zinc film thickness of 55 microns as per ASTM A123.
   b. All threaded or tapped parts shall be electro-galvanized according to ASTM B633.
   c. Color coating: Tubes, connectors and accessories shall be finished with a thermoset polyester powder applied by electrostatic spray process minimum thickness 2.0 mils., maximum of 3.0 mils, oven dried and cured. Nodes to be coated with a wet applied polyurethane finish, 1.0 mils minimum in a color to match. Color to be selected from Novum standards.

PART 3 EXECUTION

3.1 EXAMINATION

A. Scope of this section includes the installation of structural glass, point support glass fixings, support steel and accessories. The Erector shall check all metal components upon delivery for dents, gouges or other imperfections which may result in rejection of the appearance or reduce strength.

B. The Erector shall check the glass panels upon delivery for scratches, imperfections and edge damage. Damaged glass shall not be installed.

3.2 PREPARATION

A. Provide connections for temporary shoring, bracing and supports as noted on the installation drawings. Handle, lift and align pieces using padded slings, suction cups and/or other protection required to maintain the appearance of the system throughout the installation process.

B. Only lift at connections as approved by the system's Design Engineer.

3.3 INSTALLATION

A. Erect structural glazing and accessory items in strict accordance with the approved shop/installation drawings and installation procedures.

   1. Glass shall not be positioned by the use of force. Provide temporary bracing and support as required to ensure stability during installation process.
   2. Bolt Head Orientation: All exposed bolt heads shall be oriented as indicated on the approved drawings. Where bolt head alignment is specified, the orientation shall be noted for each connection on the installation drawings. Where not noted, the bolt heads in a given connection shall be oriented to one side.
   3. Field Welding: If required at glazing arm supports, weld profile, quality and finish shall be consistent with the quality of any shop welds. If not visible, then welds shall comply with visual appearance specified in AWS D1.1. Weld size shall be per the approved shop drawings. Glass must be protected from heat and splatter.
   4. All bolts shall be fully tightened in accordance with methods indicated in the installation drawings. Specified pre-stressed bolts shall be tightened using the necessary tools and the torques checked. Reset calibrations often to ensure torque is accurate.

5. Clean glazing connectors receiving glazing materials of deleterious substances that might impair the work. Remove protective coatings that might fail in adhesion or interfere with bond of sealants. Comply with the manufacturer's instructions for final wiping of surfaces immediately before the application of primer and glazing sealants. Wipe metal surfaces with an appropriate cleaning agent.
6. Sealants: Prime surfaces that are to receive glazing sealants in accordance with the manufacturer's recommendations, using recommended primers.
7. Locate setting blocks, if required by the drawings, at the quarter points of the sill, but no closer than 6 inches to corners of the glass. Use blocks of proper sizes to support the glass in accordance with the manufacturer's recommendations.
8. Ensure neoprene spacers separate the glass from attachment plates.
9. Set the glass in a manner that produces the greatest possible degree of uniformity in appearance. Face all glass, which has a dissimilar face, with matching faces in the same direction. Carefully remove all stickers and clean affected area.
10. Use masking tape or other suitable protection to limit the coverage of glazing materials on the surfaces intended for sealants.
11. Tool the exposed surface of glazing materials.
12. Clean excess sealant from the glass and support members immediately after the application, using solvents or cleaners recommended by the manufacturers.

B. Structural glazing shall be installed clean and in one visit. General Contractor shall provide protection measures for completed structural glazing and accessories to prevent damage or deterioration from subsequent work.

C. Obtain permission for any modification or field fabrication from the Engineer of the system. Glass cannot be modified.

3.4 FIELD QUALITY CONTROL AND CLEANING

A. Structural Requirements: The Owner will engage an independent testing and inspecting agency to perform field inspections, testing and prepare test reports.

B. Product Acceptance: The structural glazing and other items being supplied in the scope shall be installed clean by the Structural Glass Contractor and then protected by the General Contractor and any other following trades at their expense.

3.5 TOUCH-UP AND FINAL CLEANING

A. Touch-up Painting: Cleaning and touch-up painting of any field welds and abraded areas of shop paint or stainless parts shall be completed to blend with the adjacent surfaces of the product. Such touch-up work shall be done in accordance with manufacturer's instructions.

B. Final cleaning prior to hand over to the Owner shall be by the General Contractor.

3.6 WARRANTY

A. Provide a five (5) year warranty on the design, engineering and installation workmanship. The start date of the warranty shall be the date of Substantial Completion.

B. Provide the glass manufacturer's five (5) year warranty.

END OF SECTION